

**Chapter Project****Life's Long Calendar**

This chapter deals with changes in living things that have occurred during Earth's history. These changes occurred over hundreds of thousands, millions, and even billions of years. Such huge time spans are difficult to imagine. The Chapter Project will help you understand these time spans by converting millions and billions of years to smaller, more familiar units.

Your group will construct two models of Earth's history—two timelines drawn to scale. One timeline will show the history of life from 5 billion years ago to the present. The other timeline will show 600 million years ago to the present. The second timeline is a magnified view of a small section of the first timeline. First, your group will decide what kind of timelines to make. Next, you will calculate the scale for each model and use these scales to construct the two timelines. Then you will mark each line to show important events in the evolution of life on Earth. At the end of the chapter, your group will present and explain your timelines to the class.

Project Rules

- With your group, decide what kind of scale models to make. You could represent billions and millions of years with units of length, such as meters, or units of time, such as months in a year. List the events you plan to include on the timelines. You must include the major events that are shown in your textbook. Include at least three other events, too. Submit your plans and list to your teacher for approval.
- Make both lines the same size. Calculate the scale for each timeline. Because the second timeline is a magnified part of the first timeline, the two timelines' scales will be different. The Hints section of this Overview will help you calculate the scales. Also, Chapter Project Worksheet 1 will let you practice this step by making a timeline for your own life history.
- Construct the first timeline to scale. Mark it at equal intervals to show billions of years. Show this timeline to your teacher, and then make any necessary corrections.
- Construct the second timeline. Mark it to show millions of years.
- Add events to the timelines. Events that happened more than 600 million years ago should go on the first timeline. Events that happened during the past 600 million years should go on the second timeline. Use each timeline's scale to determine where to mark the events. Identify each event with a written label. You may also add drawings you have made of organisms.
- Present your timelines to the class. Explain why you chose the kind of model and the scales you used. Point out any events that are not on the timeline in your textbook. Be prepared to answer questions about your timelines.

Changes Over Time ▪ *Chapter Project***Overview**
(continued)**Suggested Materials**

- Your group may want to use calculators to determine the scales of your models and where to place each event on the timelines.
- **Models that use units of length:** You will need a meter stick and a metric tape measure. To make the timelines, you can use a long strip of adding machine tape, shelf paper, wide ribbon, or other material. If your group is making outdoor timelines, you can use craft sticks or index cards to mark events on the lines.
- **Models that use units of time:** If you plan to use hours in a day or minutes in an hour to represent billions and millions of years, you'll need to make a clock dial from posterboard or cardboard. If you plan to use months in a year or some other unit of time that can be shown in a long line, you can use the same materials as models that use units of length.

Hints for Calculating the Models' Scales

- **Models that use units of length** Suppose both timelines will be 10 meters long.

First timeline: 5 billion years = 10 meters

Divide 5,000,000,000 years by 10 meters. The result is 0.5 billion years for each meter.

Scale: 1 meter = 0.5 billion years, or 500 million years**Second timeline:** 600 million years = 10 meters

Divide 600,000,000 years by 10 meters. The result is 60 million years for each meter.

Scale: 1 meter = 60 million years

- **Models that use units of time** Suppose both timelines will show a 12-month year.

First timeline: 5 billion years = 12 months

Divide 5,000,000,000 years by 12 months. The result is 417 million years for each month.

Scale: 1 month = 417 million years**Second timeline:** 600 million years = 12 months

Divide 600,000,000 years by 12 months. The result is 50 million years for each month.

Scale: 1 month = 50 million years**Project Timeline****Tasks****Date Due**

1. Submit your plans and event list to your teacher. _____
2. Finish constructing the first timeline. _____
3. Finish constructing the second timeline. _____
4. Finish marking events on both timelines. _____
5. Present your models to the class. _____

Modeling Your Life History

This activity will give you practice in making a timeline to scale. Here, you will model your own life history.

Materials

paper strip about 110 cm long
meter stick or metric tape measure
calculator

Procedure

1. On the paper strip, draw a line 100 centimeters long. Label the left end of the line *Birth*. Label the right end *Today*.
2. How old are you? (To make your calculations easier, round off your age to the nearest half year.) _____ years
3. Calculate how many centimeters on the model will equal 1 year of your life. Fill in the spaces below.

100 cm = _____ years (your answer in Step 2)

Divide 100 cm by the number of years. Round off your answer to the nearest whole centimeter.

Scale: _____ cm = 1 year

Example: 100 cm = 14 years

$100 \text{ cm} \div 14 \text{ years} = 7.14 \text{ cm/yr}$, or 7 cm for each year

Scale: 7 cm = 1 year

4. Starting at the *Birth* end of the line, measure the number of centimeters to represent 1 year. Mark that place on the line and label it *Year 1*.
5. Measure, mark, and label the rest of the years in your age. Your last mark should be very close to the *Today* end of the line.
6. Now mark and label the line to show important events in your life. Use the model's scale to position each event correctly. For example, if you walked on your own for the first time when you were about $1\frac{1}{2}$ years old, multiply 1.5 by the number of centimeters that represent 1 year. Measure that distance from the *Birth* end of the line, and mark that event.

The History of Life on Earth

Your group's timelines should include many of the events shown on the timeline in your textbook. Here are some other important events in Earth's history. Include at least three of these events. You may also research other events to add to your timelines. (1,000 million = 1 billion.)

Date (millions of years ago)	Event
3,800	First cells
3,000	DNA replication
3,000	First release of oxygen
2,000	Oxygen abundant in the atmosphere
1,400	First eukaryotic cells (cells with a nucleus)
1,000	First sexual reproduction
540	First organisms with shells
505	Trilobites common
500–425	First crustaceans
425–410	First wingless insects and millipedes
410–350	Ancient sharks abundant
245	Trilobites become extinct
240	First egg-laying mammals
140	First marsupials
135	Toothed birds become extinct
35	First monkey-like primates
22	First true monkeys and apes
6	Development of grasslands; grazing animals and large carnivores abundant
1.9	Ice ages cause extinction of many plants and large animals

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Scoring Rubric



Chapter Project

Life's Long Calendar

In evaluating how well you complete the Chapter Project, your teacher will judge your work in three categories. In each, a score of 4 is the best rating.

	4	3	2	1
<i>Constructing the Timelines</i>	Demonstrates creativity in choosing a workable format for the timelines. Correctly calculates the scale of each model, and constructs two timelines to different scales. Precisely marks and labels many events included on the textbook's timeline plus three or more additional events.	Chooses a workable format for the timelines. Constructs two timelines to different scales, but the scale for one or both models has a few minor errors. Marks many events included on the textbook's timeline plus at least two additional events with fair accuracy.	Chooses a workable format for the timelines, and constructs two timelines to different scales. Incorrectly calculates the scale of one model. Marks many events included on the textbook's timeline but no additional events; some events are not accurately marked.	Chooses an unwieldy format for the timelines. Incorrectly calculates the scales of both models and/or does not construct each timeline to scale. Omits most events included on the textbook's timeline and does not include any additional events; most events are not accurately marked.
<i>Presenting the Timelines</i>	Presentation is well-organized, is complete, and demonstrates in-depth understanding of the procedures involved in constructing timelines to scale and of the relationship between the two models.	Presentation is fairly well-organized and demonstrates good understanding of the procedures involved in constructing timelines to scale and of the relationship between the two models.	Presentation is somewhat disorganized and demonstrates only a partial understanding of the procedures involved in constructing timelines to scale and of the relationship between the two models.	Presentation is disorganized and demonstrates little understanding of the procedures involved in constructing timelines to scale and of the relationship between the two models.
<i>Working Cooperatively</i>	Takes a lead in planning, constructing, and presenting both models.	Actively participates in planning and presenting both models and in constructing one or both models.	Participates at others' direction in most aspects of planning and presenting both models and in constructing one model.	Participates minimally in planning, constructing, and presenting the models.